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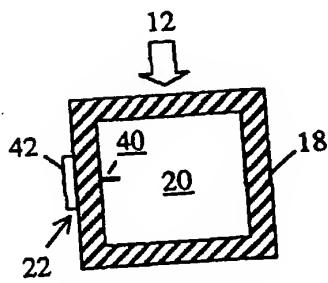
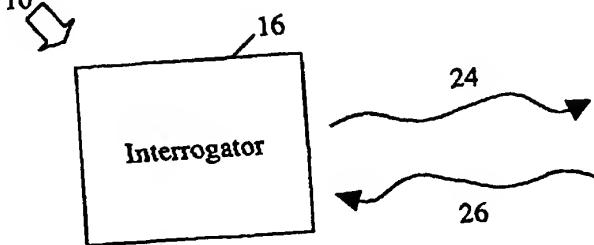
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(54) Title: MEASURING STRAIN IN A STRUCTURE (BRIDGE) WITH A (TEMPERATURE COMPENSATED) ELECTROMAGNETIC RESONATOR (MICROWAVE CAVITY)

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14

(57) Abstract: The system (10) comprises a sensor (18) 90x90x90x30 mm as an electromagnetic microwave cavity (20) with a coupler (22) with a wire (40) and an antenna (42). Cavity (20) produces a response signal (26) in response to an interrogation signal (24) from interrogator (16). Sensor (18) is coupled to a structure (14) to allow a strain to alter the resonance properties. 3.6 GHz is used with a detection of a 2.5 kHz change. If not temperature via strain is detected a mechanical amplifier is used with cavity (20) for temperature compensation. Continuous or intermittent narrowband signals are used as interrogation signals (24). Used with bridges for structural health monitoring. Also for aircrafts, dams, buildings, vehicles.

INTERNATIONAL SEARCH REPORT

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IPC 7 G01L1/25 G01B15/06 G01M19/00 G01D5/48 E01D19/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G01L G01B G01M G01D E01D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 2 212 273 A (MR. FARLEY) 19 July 1989 (1989-07-19) claim 1; figure 1 ---	1,17
X	FR 2 700 846 A (MR. BRUGIDOU) 29 July 1994 (1994-07-29) page 1, line 6 - line 15 page 3, line 9 - line 19; claim 1; figure 1 ---	25
A	JP 60 203828 A (TOSHIBA) 15 October 1985 (1985-10-15) figures 1-4 ---	
A	JP 05 264474 A (DAIPOOLE) 12 October 1993 (1993-10-12) figures 1-4 ---	
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 20 07 447 A (DECCA) 17 September 1970 (1970-09-17) page 6, line 17 - line 30; figure 1 -----	
A	US 3 909 713 A (USERDA) 30 September 1975 (1975-09-30) column 3, line 19 - line 23; figure 1 -----	
A	US 5 181 423 A (HBM) 26 January 1993 (1993-01-26) column 4, line 24 - line 33; figure 1 -----	

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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Patent document cited in search report	Publication date	Patent family member(s)		Publication date
GB 2212273	A 19-07-1989	NONE		
FR 2700846	A 29-07-1994	FR 2700846 A1		29-07-1994
JP 60203828	A 15-10-1985	NONE		
JP 05264474	A 12-10-1993	NONE		
DE 2007447	A 17-09-1970	DE 2007447 A1		17-09-1970
US 3909713	A 30-09-1975	AU 8060675 A DE 2518450 A1 FR 2269075 A1 IL 47023 A JP 51013269 A		04-11-1976 13-11-1975 21-11-1975 28-02-1977 02-02-1976
US 5181423	A 26-01-1993	DE 4033053 C1 EP 0481272 A1 JP 4230599 A		05-03-1992 22-04-1992 19-08-1992